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Fisheries Development Division
Fisheries and Habitat Management Branch

Newfoundland
Region

Ener Sea Program – 1988/89
Vessel Analysis Computing System

Project Report FDD 1988/89 – 146

Fisheries and Oceans
Pêches et Océans

Canada

MAY, 1989

ENER SEA PROJECT - 1988/89

(VESSEL ANALYSIS COMPUTING SYSTEM)

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90-01594/

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ABSTRACT

Four main activities were conducted as part of the Ener Sea program from June 1988 to March 1989. They included propeller analysis, cost reduction/energy efficiency seminars, demonstrations at sea and vessel remeasurement.

Propellers on 44 fishing vessels were analyzed and the Vessel Analysis Computing System (VACS) was demonstrated to the fishermen involved and to many others as well. Twenty seminars were held throughout the Newfoundland Region with a total of 258 fishermen in attendance. It was determined from the 18 vessels which had demonstrations conducted at sea that a reduction of 1 knot from maximum speed would result in an average fuel savings of 43 %.

The estimated impact of the Ener Sea program on the Newfoundland fishing fleet in 1988/89 from these activities amounts to total savings of approximately $246,870.00.

In addition, three vessels were measured a second time to verify the accuracy of the propeller program. It was proven that the program predicted RPM at a determined speed with 2.8% accuracy.

PREFACE

A contract was awarded to Paul Pinhorn to further develop and transfer information to the Ener Sea program. This project was a continuation of a program to develop ways and means for fishermen to reduce their operating cost.

TWO OTHER REPORTS PUBLISHED ON THE ENER SEA PROGRAM ARE:

-- PINHORN, P. , 1986. VESSEL ANALYSIS COMPUTING SYSTEM (ENER SEA) CAN. TECH. REP. FISH. AQUAT. SCI. 1529: vi+33p.

-- PINHORN, P. , 1988. ENER SEA - 1987/88 (VESSEL ANALYSIS COMPUTING SYSTEM). CAN. TECH. REP. FISH. AQUAT. SCI. 1661: vi+39p

This report was produced under DFO/DSS contract:
09SC. F8001-8-2040

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INTRODUCTION

The Ener Sea project was originally conceived as a means of training Newfoundland inshore fishermen (those operating vessels less than 65 feet) about reducing their operating costs. Through a thorough system of analyzing vessel specifications and presenting energy saving procedures in vessel operations, Ener Sea aimed at providing an improved vessel management catalyst service.

From June 1, 1988 to March 31, 1989, the Ener Sea program employed the services of a consultant who contacted fishermen and presented various energy saving concepts by organizing and conducting several seminars throughout the Newfoundland Region.

A van was outfitted to house the requisite computer system to analyze fishing vessels for propeller selection, optimum speed, etc.

The core of Ener Sea's computer system is a customized software package that predicts vessel fuel savings resulting from matching engine type and horsepower to propeller type and determining the optimum speed at which a vessel should operate.

The seminars and demonstrations emphasize the economic benefits of correct propeller configuration, hull cleaning, engine efficiency, etc.

This report outlines the work completed in this ongoing program and presents an estimate of Ener Sea's impact on the fishing industry. Actual and projected figures are provided to disclose the significance of the Ener Sea program.

The overall accuracy of the Ener Sea computer software is also addressed from data collected after the measurement of three vessels refitted according to program specifications.

VESSEL ANALYSIS COMPUTING SYSTEM (VACS)

DESCRIPTION

A versatile software package developed specifically for the Ener·Sea project, the Vessel Analysis Computing System (VACS) provides information on fuel consumption reduction based on a number of parameters provided by the operator.

The program is targeted at fishing vessels in the 30 to 65 foot L.O.A. (length over-all) range utilizing standard diesel engines under 700 horsepower and equipped with three and four-bladed propellers. The program is aimed at the typical fishing vessel in this size range including trawlers, gillnetters and longliners.

Written prinicpally in the Basic language and designed for an IBM type microcomputer, VACS is designed to be an easily accessible method for outputting information. The program requests a user input of values pertaining to the vessel specifications and outputs, both text and graphs, in pointing to an optimum vessel configuration.

The VACS package consists of five main modules, each of which is a program designed to perform a specific function. These modules provide data on propeller configurations and RPM optimization for greater fuel saving. Graphs are plotted for RPM and throttle settings and a database of fishing industry information is also included.

The following is a brief description of each program:

* **Propeller Change**

This program predicts the performance of the present propeller configuration and provides the optimum propeller diameter and pitch, as well as number of blades and the blade area ratio (B.A.R.).

The optimization portion of the program provides either torque or thrust settings (depending on the type of fishing).

Program output is tabular with the first output being the data initially entered by the operator, followed by the current propeller performance (i.e., thrust, horsepower, torque, percentage of cavitation etc.).

Next, up to three energy efficient propellers are identified. These provide information on diameter, pitch, percentage of increased efficiency and percentage of cavitation.

The operator must provide the cost of the propeller to receive other information (e.g. the estimated payback period and the rate of return in the case of a retrofit.)

* **Operating Profile**

This module calculates and obtains an operational profile from a number of variables. Revolutions per Minute (RPMs), speed and propeller parameters are provided by the operator and the program predicts speed and fuel savings at various RPM levels. It also generates thrust values for each RPM level and speed value.

* **Operational Sheet**

This program plots operational sheets based on field tests performed by the Ener Sea team. It generates graphs of RPM vs. speed and RPM vs. fuel consumption for verification of field data.

* **Throttle Simulation**

This graph module plots the operations pattern based on RPM, speed and fuel consumption at different throttle settings. It also generates speed and fuel consumption curves for each vessel tested.

* **Ener Sea Data Management System (EDAMS)**

This is a database of industry contacts, project information and fleet data management. This organizational tool contains six database modules encompassing personnel, industry contacts, project information and fleet data management.

Designed to facilitate future changes in the Ener Sea program, EDAMS allows Ener Sea personnel immediate access to relevant information both in the office or in the field. The VACS system outputs a combination of screen and printed information, in tabular or graph form. Figure 1 is an example of program output. Designed to run on a floppy diskette based system, VACS is an-easy-to-use, easily transported vehicle utilized for dissemination of crucial cost-cutting information to the small vessel fishing industry.

FUEL COSTS VS TIME

1 THE COST OF FUEL WITH THE MODIFICATION
2 THE COST OF FUEL WITHOUT THE MODIFICATION

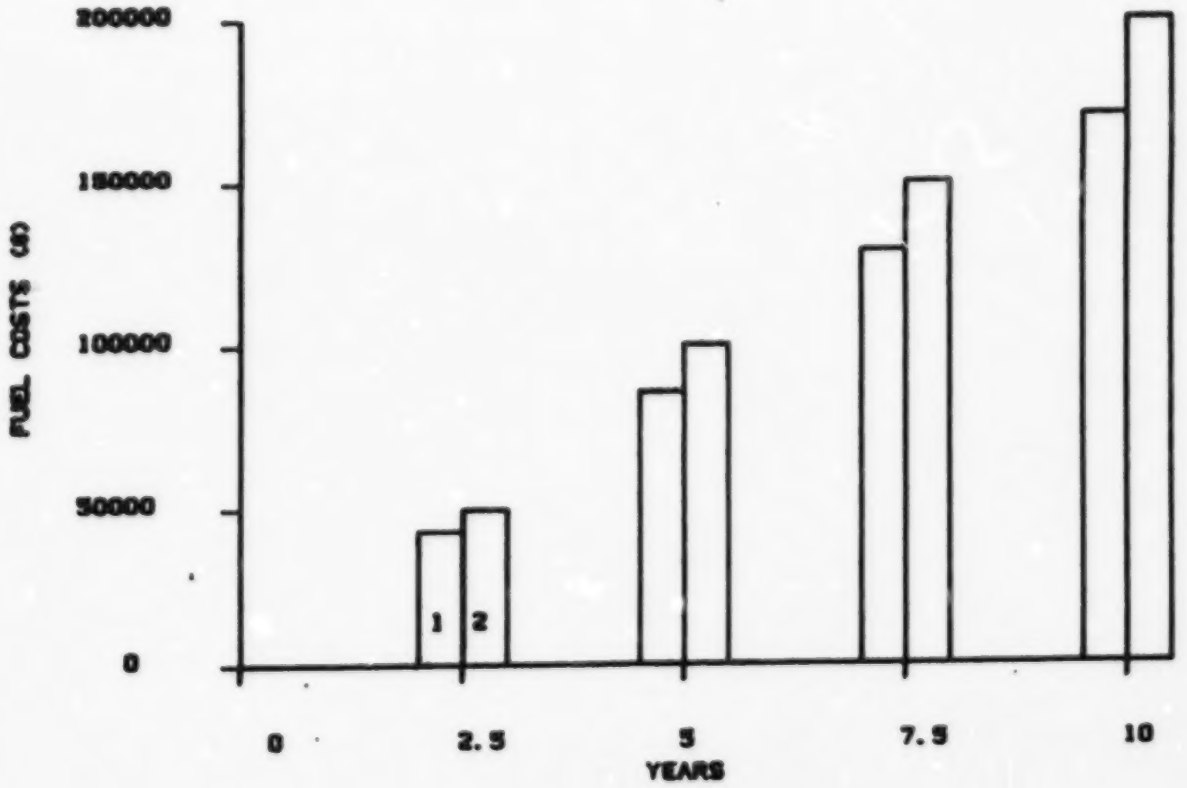

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FIG 1.

UPGRADING AND VERIFICATION OF VACS

As part of the verification procedure for VACS, five vessels were selected for rigorous field tests. These vessels were equipped with a propeller recommended by the VACS program.

This was an excellent opportunity to check the prediction of the propeller program against data collected during field tests to ensure that the program could accurately optimize propellers for vessels from 30 to 65 feet L.O.A.

Since speed and RPM were measured during the testing, it was logical to compare the predicted RPM at a given speed to the actual values gathered (VACS printouts used for these comparisons are available upon request).

The following is a summary of each vessel analyzed and the results obtained:

Vessel # 1 - CRAB BOAT

L.O.A.	65'
BREADTH	20'
DRAFT	9.5'

HULL MATERIAL Steel

	OLD CONFIGURATION	NEW CONFIGURATION
ENGINE	520 HP Volvo	675 HP Cummins
GEAR RATIO	3.2:1	4.13:1
PROPELLER DIAMETER	54"	60"
PROPELLER PITCH	30"	40"
NO. OF BLADES	3	4
B.A.R.	0.46	0.62
MAX RPMs	1920	1800

REASON FOR RETROFIT

To operate more effectively in bad sea conditions and to burn less fuel.

PREDICTIONS FROM CHANGE

The program indicated that by increasing the diameter, number of blades, gear ratio and B.A.R., the vessel would not lose speed in bad sea conditions. Also, by making this change, a decrease in fuel consumption would be realized while still maintaining the same speeds prior to the retrofit.

The following is a comparison of the prediction of speed vs. the actual RPM and speed:

PREDICTED RPM vs SPEED BEFORE NEW PROPELLER RETROFIT

Predicted RPM	- 1791	- 1648
Predicted speed	- 9.8 knots	- 9.0 knots
	VACS output from predictions	
Thrust	- 10358 lbs	- 8809 lbs
Power (shp)	- 513 HP	- 400 HP
Efficiency	- 48.7 %	- 48.6 %

ACTUAL RPM vs SPEED AFTER PROPELLER RETROFIT

Actual RPM	- 1765	- 1600
Actual speed	- 9.8 knots	- 9.0 knots
	VACS output from actual	
Thrust	- 9952 lbs	- 8078 lbs
Power (shp)	- 486 HP	- 359 HP
Efficiency	- 49.2 %	- 49.7 %

Vessel # 2 - GILLNETTER

L.O.A.	42'
BREADTH	15' 3"
DRAFT	2'6"

HULL MATERIAL Wood

	OLD CONFIGURATION	NEW CONFIGURATION
ENGINE	135 HP Perkins	135 HP Perkins
GEAR RATIO	2.1:1	2.1:1
PROPELLER DIAMETER	26"	26"
PROPELLER PITCH	15"	15"
NO. OF BLADES	3	3
B.A.R.	0.52	0.52
MAX RPMs	1921	2157

OBJECT FOR CHANGE

The owner required a speed prediction based on RPM increase and front adjusting the governor on the engine.

PREDICTIONS FROM CHANGE

The following contains the prediction of RPM vs speed before and after the change:

PREDICTED RPM vs SPEED BEFORE ADJUSTMENT

Predicted RPM	- 2225	- 2055
Predicted speed	- 8.0 knots	- 7.5 knots
	VACS output from predictions	
Thrust	- 1903 lbs	- 1607 lbs
Power (shp)	- 88 HP	- 68 HP
Efficiency	- 42.6 %	- 43.2 %

ACTUAL RPM vs SPEED AFTER ADJUSTMENT

Actual RPM	- 2157	- 2006
Actual speed	- 8.0 knots	- 7.5 knots
	VACS output from predictions	
Thrust	- 1750 lbs	- 1504 lbs
Power (shp)	- 79 HP	- 63 HP
Efficiency	- 43.7 %	- 44.0 %

Vessel # 3 - GILLNETTER

L.O.A.	46'
BREADTH	12'
DRAFT	4' 6"

HULL MATERIAL Steel

	OLD CONFIGURATION	NEW CONFIGURATION
ENGINE	190 HP Caterpillar	190 HP Caterpillar
GEAR RATIO	2:1	3.047:1
PROPELLER DIAMETER	28"	28"
PROPELLER PITCH	20"	26"
NO. OF BLADES	4	4
B.A.R.	0.69	0.69
MAX RPMs	2200	2650

OBJECT FOR CHANGE

The owner changed his vessel's gear ratio from 2:1 to 3.047:1. He requested the correct pitch from this modification.

PROGRAM PREDICTIONS

The following is the prediction of RPM vs speed before and after the change.

PREDICTED RPM vs SPEED BEFORE REPITCHING

Predicted RPM	- 2665	- 2021
Predicted speed	- 12.0 knots	- 10.0 knots
	VACS output from predictions	
Thrust	- 3069 lbs	- 1615 lbs
Power (shp)	- 180 HP	- 73 HP
Efficiency	- 50.2 %	- 54.3 %

ACTUAL RPM vs SPEED AFTER REPITCHING

Actual RPM	- 2621	- 2131
Actual speed	- 12.0 knots	- 10.0 knots
	VACS output from actual	
Thrust	- 2926 lbs	- 1892 lbs
Power (shp)	- 169 HP	- 89 HP
Efficiency	- 51.0 %	- 52.0 %

TABLE 1. % ERROR OF PREDICTED vs. ACTUAL RPM

VESSEL #	SPEED	PREDICTED RPM	ACTUAL RPM	% ERROR
1	9.80 9.00	1791 1648	1765 1600	1.5 2.9
2	8.00 7.50	2225 2055	2157 2006	3.1 2.4
3	12.0 10.0	2665 2021	2621 2131	1.7 5.2
			AVERAGE	2.8

As seen from Table 1. the VACS package can acurately predict RPM at a required speed with only a 2.8 % error.

VESSEL ANALYSIS (VACS)

The VACS software already described and the hardware it runs on were placed in a motorized van so that the system could be easily transportable to fishermen.

Program output provides results from difficult calculations involved in vessel analysis. The graphs or tables developed by the program are available as printouts transferred to fishermen during field trips or by mail.

Many fishermen have been exposed to the VACS program since the beginning of the Ener Sea project. During the present contract, fishermen have had their vessels' propellers analyzed by VACS and have seen VACS demonstrations either through seminars or by demonstrations at sea (Table 2).

Although VACS is the core of the Ener Sea program, it also encompasses a series of seminars, field testing procedures and consultation that enhances its capacity as a management tool for the fishing industry.

Since VACS has been introduced, 241 vessels have been analyzed for propeller optimization, as well as the fuel reduction module. It is difficult to determine how many vessel owners are familiar with VACS, though many initial contacts with fishermen and fishermen's groups have indicated that the program has received copious attention within the industry.

With the present contract, a system of field tests is being undertaken to correlate program results with actual performance.

By using data collected through this method and from propeller manufacturers, more accurate values for speed, fuel consumption, RPM and B.A.R. could be realized in VACS.

Given the variety of vessel types within the Newfoundland inshore fisheries, a collection of field data could ensure that the database growing through the VACS program will be compatible throughout the industry.

It is intended to continue analyzing vessels since requests from fishermen for this type of information are mushrooming. Most vessel owners seem to realize the potential savings from a program like VACS and they seek out this service as a means of cutting their operating costs.

TABLE 2. VESSELS ANALYZED FOR PROPELLER CHANGE

METHOD OF CONTACT	NUMBER OF VESSELS
Seminars	29
Phone & Mail	13
Consulting Companys	2
	44

ENERGY EFFICIENCY/COST REDUCTION SEMINARS

Since June, 1988, 20 cost reduction/energy efficiency seminars have been held throughout Newfoundland (see table 3 and Fig. 2). These seminars consist of an audio visual component, a demonstration of the VACS program and a consultation with the seminar audience.

The seminars expose vessel owners and fishermen to various cost-cutting methods. The agenda (Fig 3.) includes a choice of five video tapes (Cutting the Cost, Picking a Prop, Engine Efficiency, Propeller Performance and Care of Your Outboard). Fishermen also receive information packages containing a complete outline of materials presented during the seminar. These include pamphlets on various topics and sample VACS output.

Following each meeting, appointments for the Energy Efficiency Analysis modules of VACS are made. A majority of requests arising out of these seminars is for information relating to the VACS propeller program and the fuel consumption testing module.

To date, 51 seminars have been held in the Newfoundland Region.

TABLE 3: SUMMARY OF ENERGY SEMINARS 1988/89

SEMINAR NO.	LOCATION	NO. OF ATTENDANTS	DATE
1	BURGEO	3	DEC.5/1988
2	LAWN	7	DEC.13/1988
3	WHITEWAY	2	DEC.19/1988
4	HEART'S CONTENT	7	DEC.19/1988
5	HANTS HR.	7	DEC.20/1988
6	HICKMANS HARBOUR	20	JAN.9/1989
7	CANNINGS COVE	12	JAN.16/1989
8	PLATE COVE	10	JAN.17/1989
9	GREENSPOND	14	JAN.23/1989
10	EASTPORT	6	JAN.24/1989
11	MIDDLE ARM	12	FEB.24/1989
12	BEACHSIDE	14	FEB.15/1989
14	WILD COVE	7	FEB.15/1989
16	JACKSONS ARM	19	FEB.16/1989
15	MARINE INSTITUTE	8	FEB.20/1989
16	TRITON	12	MAR.6/1989
17	ROBERTS ARM	6	MAR.7/1989
18	MOORES COVE	17	MAR.8/1989
19	TORBAY	30	MAR.22/1989
20	FOGO ISLAND	45	MAR.29/1989
TOTAL		258	

FIG 2.

DISTRIBUTION OF COST REDUCTION/ ENERGY EFFICIENCY SEMINARS IN THE NFLD REGION

FIG 3.

COST REDUCTION/ENERGY EFFICIENCY SEMINAR AGENDA

1. General Introduction

2. Sound-On-Slide/Video Tape "Cutting the Cost."

3. Demonstrations at sea for fuel consumption, RPM & speed.

   a) Reason for demonstrations
   b) Equipment used in demonstrations
   c) Example of vessels measured
   d) Summary of demonstrations

4. Sound-On-Slide/Video Tape "Propeller Performance."

5. EMER SEA Van Program.

6. Propeller Analysis:

   a) Input Parameters,
   b) Present Propeller Conditions and Optimized Blade,
   c) Cost and Benefits.

7. Bottom Cleaning:

   a) Input Parameters,
   b) Cost and Benefits.

8. Operational Profile:

   a) Input Parameters,
   b) Output Profile

9. Sound-On-Slide/Video Tape "Picking a Prop."

10. Appointments for Energy Efficiency Analysis.

11. Closing Remarks.

Handouts included:

a) Pamphlet "Cutting the Cost."
b) Operational Profile Sheet.
c) Pamphlet "Picking a Prop."
d) Summary of EMER SEA Van Program.
e) Propeller Analysis - Input and Output Parameters.
f) Bottom Cleaning - Input and Output Parameters.
g) Operational Profile - Input and Output Parameters.
h) Pamphlet "Engine Efficiency."
i) Pamphlet "Fishing and Fuel Efficiency."
   (How to make more money catching fish.)
j) Pamphlet "Cutting Fuel Costs.)"
   (Alternatives for commercial fishermen.)

DEMONSTRATIONS FOR FUEL CONSUMPTION, RPM AND SPEED

OBJECTIVES

From the inception of this contract in June, 1988, demonstrations have been carried out on 18 vessels in the 30 to 65" L.O.A. range (see Table 4 and Fig 4).

The aim of these tests is to assist fishermen in determining the relationship between RPMs, speed and fuel consumption. The determination of an optimum RPM level which can balance speed and fuel consumption is the overall objective.

A secondary objective is the collection of data capable of testing computer predictions against real conditions. The results of these tests could point to further changes required in the program, respective to vessel type or size, and to further the understanding of the relationship between speed and fuel consumption in various sea and vessel conditions.

PROCEDURE

Although these tests are performed on an "as requested basis", there is considerable care taken to ensure that test results maintain a number of constants.

As far as possible, tests are carried out in conditions where wind and current have minimal effect. Generally, these are held in bays and sheltered areas when wind speed is less than 10 knots. Tide conditions and wind speeds existing during the tests are minimized by averaging results on a return trip basis.

In other words, the vessel is required to steam at the same RPM both on the outward and homeward portion of the test, thereby averaging any effect of wind and current.

The test involves obtaining the vessel captain's permission in steaming to a sheltered test area. Six round trips are conducted at 200 engine RPM.

As these tests are conducted, one Ener Sea team member measures fuel consumption and another attempts to monitor the constancy of speed and RPM. A stopwatch is employed aboard the vessel to provide information on the rate of fuel consumption at various levels as the fuel moves through a measuring device. A stroboscope and radar gun are used to measure RPM and speed.

EQUIPMENT

Radar Gun

A hand-held radar gun (Fig. 5), similar to those used by police forces but modified for accurate low-speed recording, is utilized. The unit consists of a hand held emitter/receiver with a digital display.

The device determines the speed of the vessel by relating vessel movement relative to a fixed point on shore. Readings are given in miles per hour.

Stroboscope

The stroboscope (Fig. 6) consists of a strobe light with a digital display attached. Powered by batteries, this hand held unit projects a light unto the flywheel of an engine and adjusts two dials until the flywheel appears to be stationary. When this occurs, the exact RPM appears on the display.

Standpipe

A standpipe, (Fig. 7) composed of one plastic cylinder contained in an aluminum case, is used to measure the consumption of fuel. Connected with clear 3/8" hose to the main fuel line, the cylinder contains graduated volume levels, which accurately indicate fuel amounts. The cylinder is filled through a two-way valve from the bottom with a 25 litre tank mounted on top of the wheelhouse.

TABLE 4: SUMMARY OF VESSELS DEMONSTRATED FOR FUEL CONSUMPTION, RPM, AND SPEED

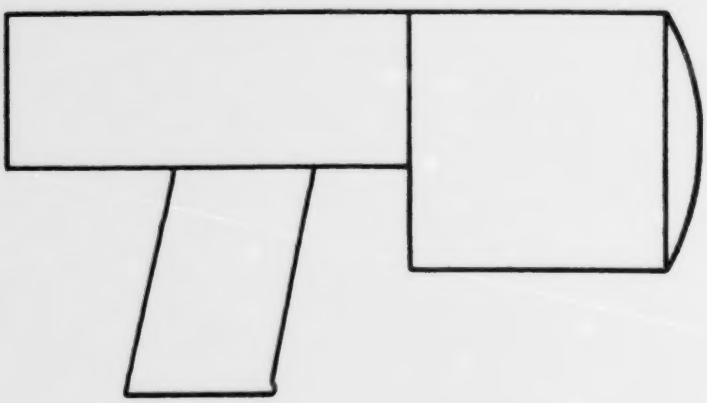
VESSEL NO.	VESSEL LENGTH (FT)	ENGINE HP. (MAX)	% FUEL SAVED FROM A DROP OF 1 KNOT FROM MAXIMUM SPEED
1	50	156	41
2	65	685	43
3	40	154	40
4	53	220	45
5	41	236	61
6	35	90	52
7	36	125	57
8	42	135	27
9	36	62	45
10	65	328	39
11	52	185	28
12	32	85	55
13	65	350	32
14	41	187	51
15	58	250	41
16	52	228	37
17	52	165	33
18	52	258	44
AVG.	**48**	**217**	**43**

FIG 4.

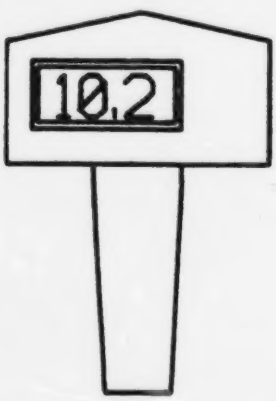
DISTRIBUTION OF DEMONSTRATIONS AT SEA WITHIN THE NFLD REGION

FIG 5.

RADAR GUN DETAILS

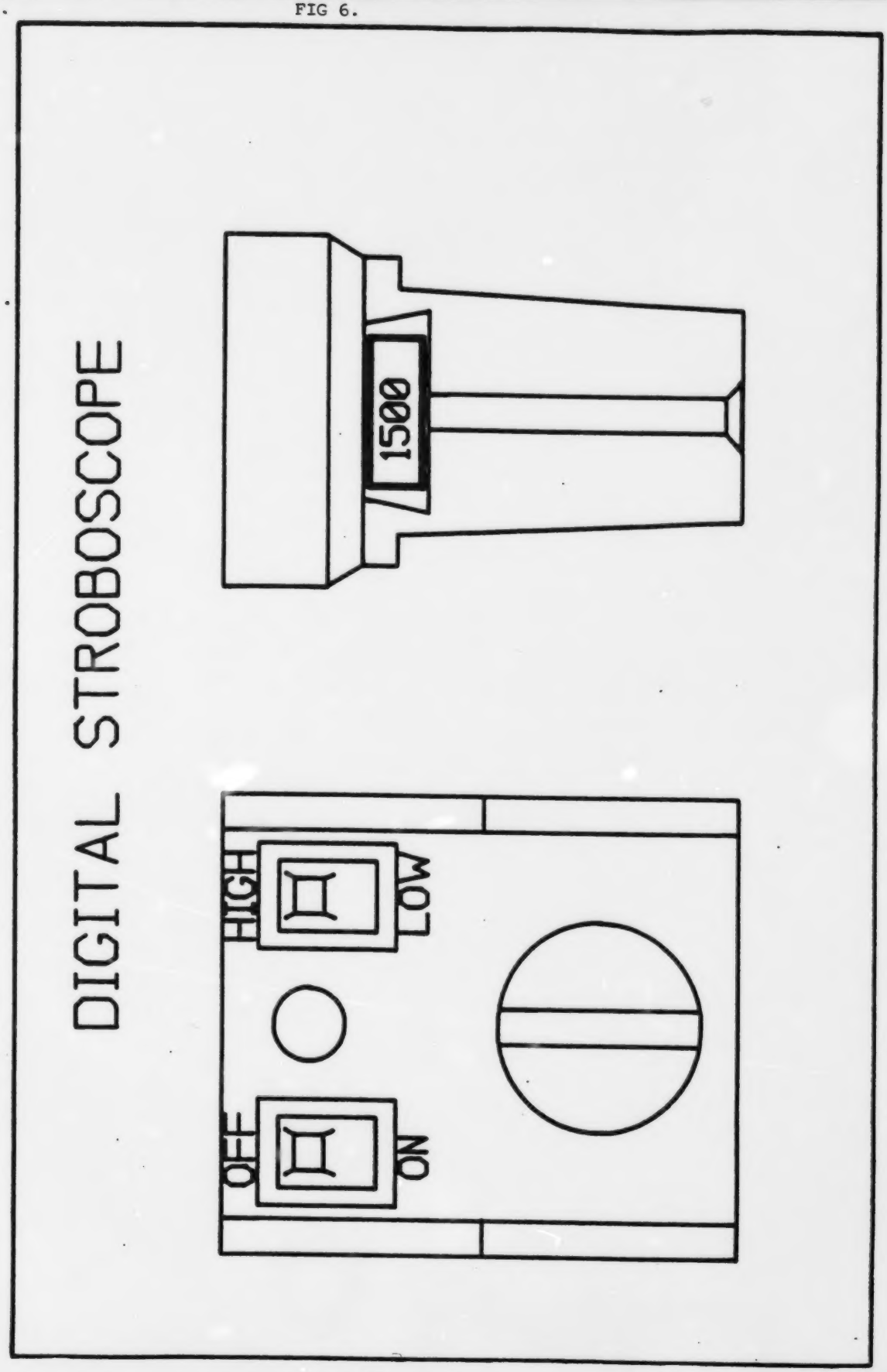


SIDE VIEW



REAR VIEW

FIG 6.



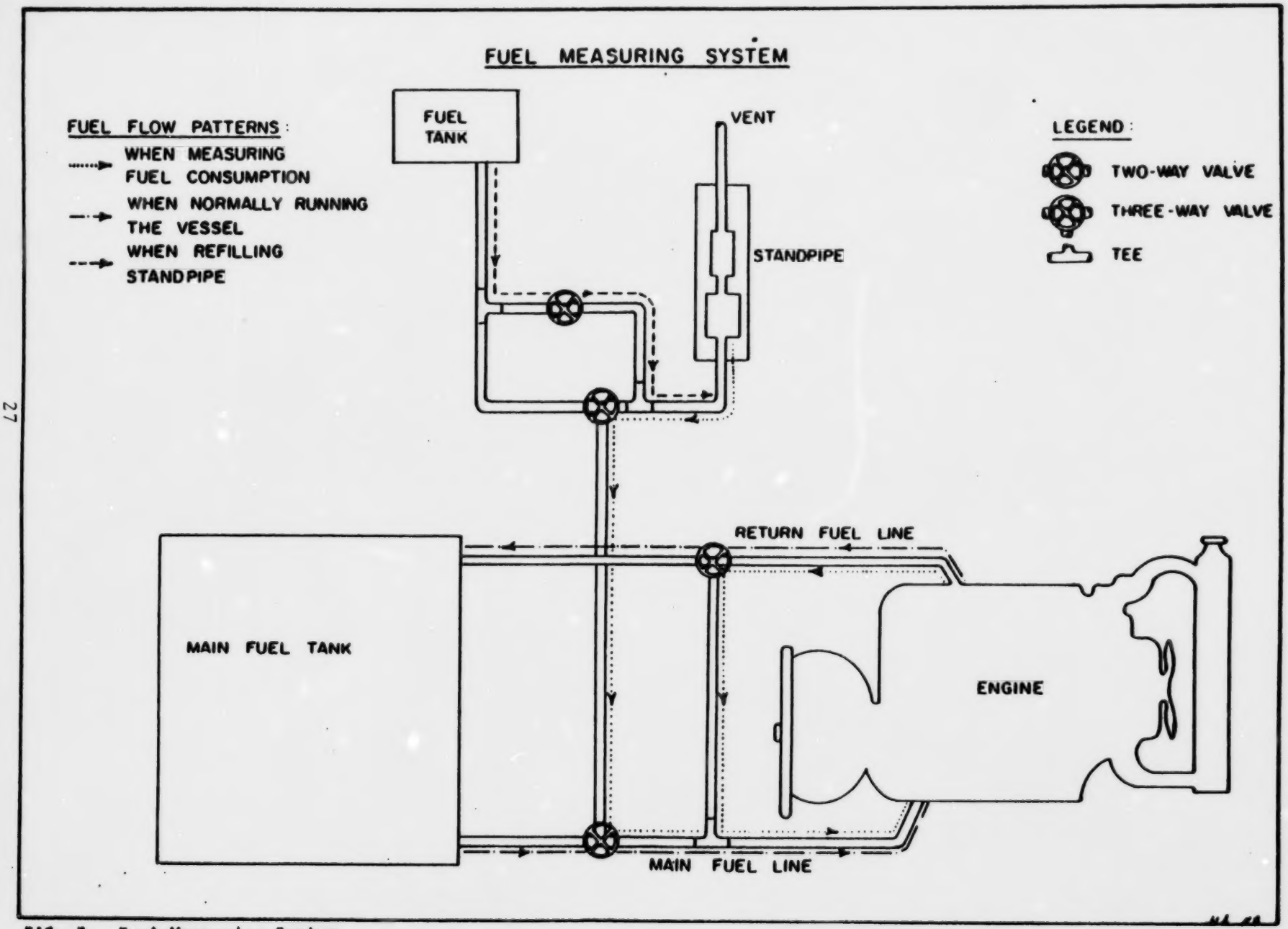


FIG. 7. Fuel Measuring System

FIG 7.

RESULTS & OBSERVATIONS

Generally six runs are conducted at increasing engine revolutions. However, the run completed - and therefore the data obtained - is dictated by the captain's willingness to operate the vessel at high engine RPMs.

As the test proceeds, one member of the Ener Sea team measures fuel consumption while the other monitors RPM and speed. A stopwatch determines the time required to burn a measured amount of fuel. Several readings are taken from each instrument while steaming.

After each demonstration, the vessel captain is presented with a table of his vessel's results. This table shows the engine's fuel consumption at various speeds and RPMs (Fig. 8).

Although efforts have been made to gather information from all types of fishing vessels in the outlined length and engine size group, the bulk of the testing was completed on vessels in the 35'- 55' L.O.A. range (See Figure 9). However, the fact remains that the smaller vessels are more abundant in the Newfoundland Region and more information exists for vessels in the under 55' L.O.A. groupings.

ENER SEA VESSEL OPERATIONAL GUIDE

M.V.: SEA QUEEN II LENGTH: 53 ft ENGINE: 220HP CAT DATE: JL/88

RPM (engine)	SPEED (knots)	FUEL CONSUMPTION (gal/hr)	DROP IN SPEED FROM MAX (knots)	DROP IN CONSUMPTION FROM MAX (gal/hr)	FUEL SAVED PER TRIP
2100	9.95	10.50	0.00 (0%)	0.00 (0%)	0%
2000	9.83	9.22	0.12 (1%)	1.28 (12%)	11%
1900	9.50	7.65	0.45 (5%)	2.85 (27%)	24%
1800	9.14	6.38	0.81 (8%)	4.12 (39%)	34%
1700	8.82	5.05	1.13 (11%)	5.45 (52%)	46%
1600	8.52	4.22	1.43 (14%)	6.28 (60%)	53%

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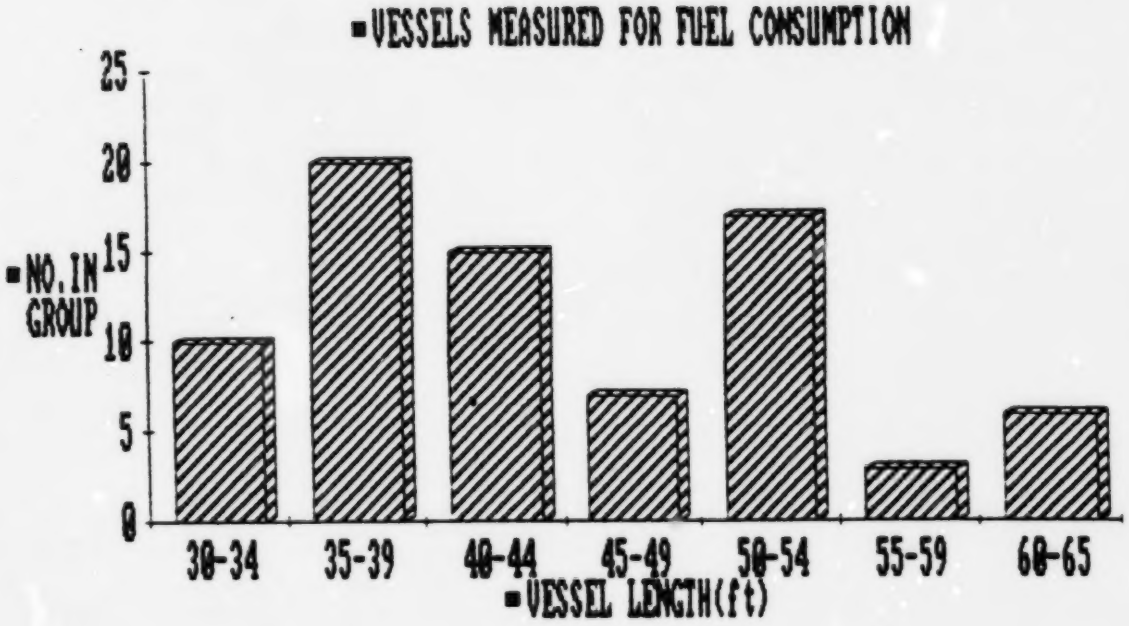
FIG 8.

FIG 9.


VESSELS MEASURED FOR FUEL CONSUMPTION
NO. IN GROUP
25
20
15
10
5
0
30-34
35-39
40-44
45-49
50-54
55-59
60-65
VESSEL LENGTH(ft)

ENER SEA IMPACT ON FISHING INDUSTRY

Over the past five years, propeller analyses have been carried out on 241 vessels. The relationship between fuel consumption, RPM and speed was demonstrated at sea on 82 vessels. Also, 51 energy efficiency/ cost reduction seminars have been held, informing some 735 fishermen of practical ways to reduce operating costs.

Recently several studies and surveys were conducted to assess the impact of these activities. Based on these, the following conclusions have been reached:

1. As a result of the cost reduction/energy efficiency seminars, fishermen have adopted the practice of running their vessels at reduced RPM levels and have saved as much as 19.3% of their fuel costs.

2. The vessel measurements for fuel consumption, RPM and speed has had the effect of reducing RPMs and saving an estimate of 18.5% among participants.

3. The propeller analyses carried out on vessels are reported to save owners in the vicinity of 4.0% fuel. An additional savings would occur from reduced cavitation.

These figures are arrived at from financial data contained in a recent report ("Analyses of Ener Sea Potential", Burry, 1987) and statistical data from the Statistics and Systems Branch of the Department of Fisheries and Oceans. These figures are based on average fuel costs and the number of vessels in the fleet between 30' and 65' L.O.A.

The following is an estimate of the impact of Ener Sea based on these figures:

COMPARISON OF PROJECTED AND ESTIMATED IMPACT

FOR WORK COMPLETED IN 1988/89

Based on a recent report, Pinhorn, P. , 1988 . Ener Sea - 1987/88 (Vessel Analyses Computing System) Can. Tech. Rep. Fish. Aquat. Sci. 1661: vi+39, some total savings of $244,567.00 were projected for the 1988/89 fishing season.

This is a projection of Ener Sea's impact based on the total amount of fuel burned per annum by the Newfoundland inshore fishing fleet and also based on a projected fuel savings from cost reduction seminars, propeller analyses and RPM reduction.

The following is a comparison of those projections and the savings calculated from the actual work in 1988/89:

Summary of the Ener Sea Project 1988/89

Cost Reduction/ Energy Efficiency Seminars - 20

Total attendance - 258

Propeller Analyses - 44

Demonstrations at Sea - 21

SAVINGS FROM COST REDUCTION/ENERGY EFFICIENCY SEMINARS

Fuel savings (RPM reduction) = (No. of fishermen)

x (Average fuel cost) x (Savings from seminars)

= (258) x ($4453) x (0.193)

= $221,733.00

SAVINGS FROM PROPELLER ANALYSIS

Fuel savings (Propeller change) = (No. of vessels analysed)

x (Average fuel cost) x (Savings from propeller)

= (44) x ($4453) x (0.185)

= $7,837.00

SAVINGS FROM DEMONSTRATIONS AT SEA

Fuel savings (RPM reduction) = (No. of vessels)

x (Average fuel cost) X (Savings from demonstrations)

= (21) x ($4453) x (0.185)

= $17,300.00

TOTAL SAVINGS FROM THREE ACTIVITIES

= FUEL SAVED FROM SEMINARS + FUEL SAVED FROM PROPELLER ANALYSIS + FUEL SAVED FROM DEMONSTRATIONS AT SEA

= $221,733.00 + $7,837.00 + $17,300.00

= $246,870.00

The savings calculated from the the actual work carried out has a % error of 1 % to the savings calculated on the projections made in 1987/88 of $244,576.00.

CONCLUSIONS

The primary effect of the technology transfer of the Ener Sea project is to point out to vessel owners and fishermen that sound management principles, like paying close attention to fuel consumption, can result in reduced costs. This is becoming critical as fishermen steam farther and consume more fuel.

The Ener Sea program continues to attract attention from the fishing industry as vessel owners become conscious of critical aspects of their operations, like energy consumption. From vessel remeasurements taken this year, it was found that the propeller program predicted speeds within an accuracy of 2.8 %.

This level of energy conservation is generally accepted within the industry as realizable through a program like VACS and through informational Ener Sea seminars.

Since the Ener Sea project has become in 1988/89 mainly a means of transferring information to these owners, it was possible in this year to reach more fishermen and outline to them the benefits to be obtained from project services. The response is an increase in the number of requests for these services.

As a result of this information transfer, an estimated savings of $246,870.00 occurred in 1988/89. This is only a 1 % difference from earlier projections of $ 244,567.00 . Based on this information, a continuation of this type of information dissemination could realize $6,000,000 by 1993.

RECOMMENDATIONS

Based on the findings of this report, the following recommendations are offered to enhance information dissemination for the fishing industry in Newfoundland:

1. Seminars outlining cost efficient vessel operating methods should be continued. These seminars should incorporate new material as it is gathered and should become a focus for the most up-to-date information in this area.

2. As a means of correlating VACS program estimates against real life situations, the RPM, speed and fuel consumption tests should be continued. This will have the dual benefit of adding to the Ener Sea database and also assist vessel owners in reducing their operating costs.

3. For the same reasons as above, propeller analyses should continue. The optimization provides information useful both for fuel consumption analysis and serves to build on the existing base of knowledge.

4. Where data is insufficient, particularly pertaining to a range of vessels between 55 and 65 feet L.O.A., more testing is required. The process of storing and utilizing data should continue with recommendations for vessels outside the range category of the present project.

5. New material should be incorporated into the Ener Sea project where feasible. Safety and stability on board vessels, new propeller product information and any other significant industry data could be transmitted along through a seminar format like Ener Sea's.